

CHAPTER 2

A Comprehensive Review of *Cryptolepis buchananii* R.Br. ex Roem. & Schult.

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ABSTRACT

Cryptolepis buchananii R.Br. ex Roem. & Schult., a woody climber belonging to the family Apocynaceae, is increasing scientific attention for its rich ethnomedicinal properties and broad-spectrum pharmacological activities. The plant has been extensively used to treat skin disorders, fever, inflammation, rickets, and blood impurities. Recent phytochemical investigations have led to the isolation of several bioactive compounds, including alkaloids, glycosides, and a novel proteolytic enzyme named cryptolepain. Pharmacological studies have demonstrated significant anti-inflammatory, analgesic, chondroprotective, antioxidant, and hypoglycemic activities. Botanical description of the plant with local names, bioactive compounds and pharmacological properties are described in detail.

Keywords: Medicinal climber, Apocynaceae, phytochemical analysis, traditional medicine

INTRODUCTION

Cryptolepis buchananii, commonly known as Wax-leaved Climber or Indian Sarsaparilla in English and "Krishna Sariva" in Ayurveda. Vernacular names of *C. buchananii* are kala bel (Hindi), Dudhi lata (Odia), Dudh-vel (Marathi), Katupaalvalli (Telugu). It is a perennial climbing shrub belonging to the family Apocynaceae (Kumar et al. 2022). This plant is indigenous to the tropical and subtropical regions of India and Southeast Asia, thriving in well-drained, sandy-loam acidic soils with abundant organic matter. It prefers a subtropical warm climate with well-distributed rainfall and typically grows in shaded areas, requiring support for climbing (Pushpalatha et al. 2011; More and Mali 2018). Morphologically, *C. buchananii* is characterized by glabrous, shining leaves that are elliptic to oblong-lanceolate in shape. The plant produces cylindrical stems with milky latex. The fruit is a follicle containing ovate-oblong, compressed black seeds (Nayak and Kumar 2023). Traditionally, various parts of *C. buchananii* have been utilized in folk medicine. The roots are considered demulcent, alterative, and tonic, and are used to treat conditions such as loss of appetite, fever, and skin diseases (Wongyai et al. 2020; Nayak and Kumar 2023). They are also regarded as blood purifiers and are extensively used in the treatment of leprosy and other dermatological conditions. In children, the roots are prescribed for managing rickets (Wongyai et al. 2020). Phytochemical investigations have revealed the presence of various bioactive compounds in *C. buchananii*. Stems contain alkaloids such as b Buchananine, identified as 6-O-nicotinoyl- α -glucopyranose and 1,3,6-O-trinicotinoyl-L-glucopyranose (Li et al. 2014). Additionally, a serine protease named cryptolepain has been isolated from the plant, exhibiting significant biochemical properties (Pande et al. 2007). Pharmacological studies have demonstrated the plant's anti-inflammatory potential, also reducing tumor necrosis factor- α (TNF- α) release from stimulated human monocytic cells, indicating its potential in managing inflammatory conditions (Laupattarakasem et al. 2006; Subedi et al. 2020). *C. buchananii* is a climber of significant medicinal value, with traditional uses supported by contemporary pharmacological research.

TAXONOMY

C. buchananii is a large, perennial, woody, much-branched climbing or straggling shrub, often extending up to 6 meters in length. The stem is cylindrical, pale-colored, and glabrous, exuding a characteristic milky latex when cut. The basal portions of mature branches appear black and dotted

(Hanprasertpong et al., 2014). The root is externally dark brown to blackish, with a few transverse cracks, the bark adheres closely to the wood and is odorless. The leaves are opposite, borne on 1 cm long petioles, and exhibit a variety of shapes elliptic, oblong, or oblong-lanceolate. They typically measure $7.5\text{-}12.5 \times 3.8\text{-}6.3$ cm, though variations up to 18 cm in length are reported. The apex is retuse, acute, or sometimes apiculate; the base is broadly wedge-shaped. The upper surface is smooth and shiny green, while the lower surface is pale or whitish (More and Mali 2018). The inflorescence is a short axillary cymose panicle, shorter than the leaves and bracteate. Bracts are ovate-lanceolate with scarious margins. The flowering period extends from March to August, peaking in June (Nayak and Kumar 2023). Flowers are small, pale greenish-yellow or yellow-white. The calyx is lobed, with ovate and acute lobes, while the corolla is also lobed, with linear to linear-lanceolate petals measuring about 0.6 - 0.7 cm in length. The flower tube is around 2 mm long (Hanprasertpong et al. 2014). The fruit is a cylindrical follicle, stout, straight, terete, and tapering, measuring between 2.5 - 10 cm long, sometimes reaching 9 cm, and bearing two longitudinal ridges. Seeds are ovate-oblong, about 0.5 cm long, compressed, and black or brownish (Kumar et al. 2022; Nayak and Kumar 2023; Plate 1).

TRADITIONAL USES

C. buechananii is a climbing shrub commonly found in evergreen forests across Thailand, China, India, Nepal, and the Indo-Chinese region. It holds significant ethnomedicinal value and is widely used in traditional healing systems throughout Southeast Asia. In Thailand, the plant is locally known as “Thao En On” and is traditionally used to treat inflammatory conditions, particularly muscle and joint pain (More and Mali 2018; Wongyai et al. 2020). The stems are commonly applied to manage muscle tension, tendon stiffness, and arthritis, while the leaves are used as a poultice to alleviate inflammation in conditions such as myalgia and arthritis. In the Indian subcontinent, *C. buechananii* is extensively employed in Ayurvedic and tribal medicine. The root is traditionally regarded as demulcent, alterative, and tonic, and is used to treat fever, appetite loss, and a range of skin disorders (Kumar et al. 2022; Nayak and Kumar 2023). Among various tribal communities, the plant is highly valued for its role in healing bone fractures; plant-based pastes or decoctions are applied locally to promote bone regeneration. It is also prescribed for rickets in children, likely due to its mineral-rich profile that supports bone health. Furthermore, the root is considered a potent blood purifier and is employed in the management of skin diseases, including leprosy

(Nayak and Kumar 2023). In Southeast Asia, the stem is frequently used to relieve musculoskeletal disorders such as muscle stiffness, tendonitis, and arthritis, reflecting its traditional reputation as an anti-inflammatory remedy (Wongyai et al. 2020; Table 1).

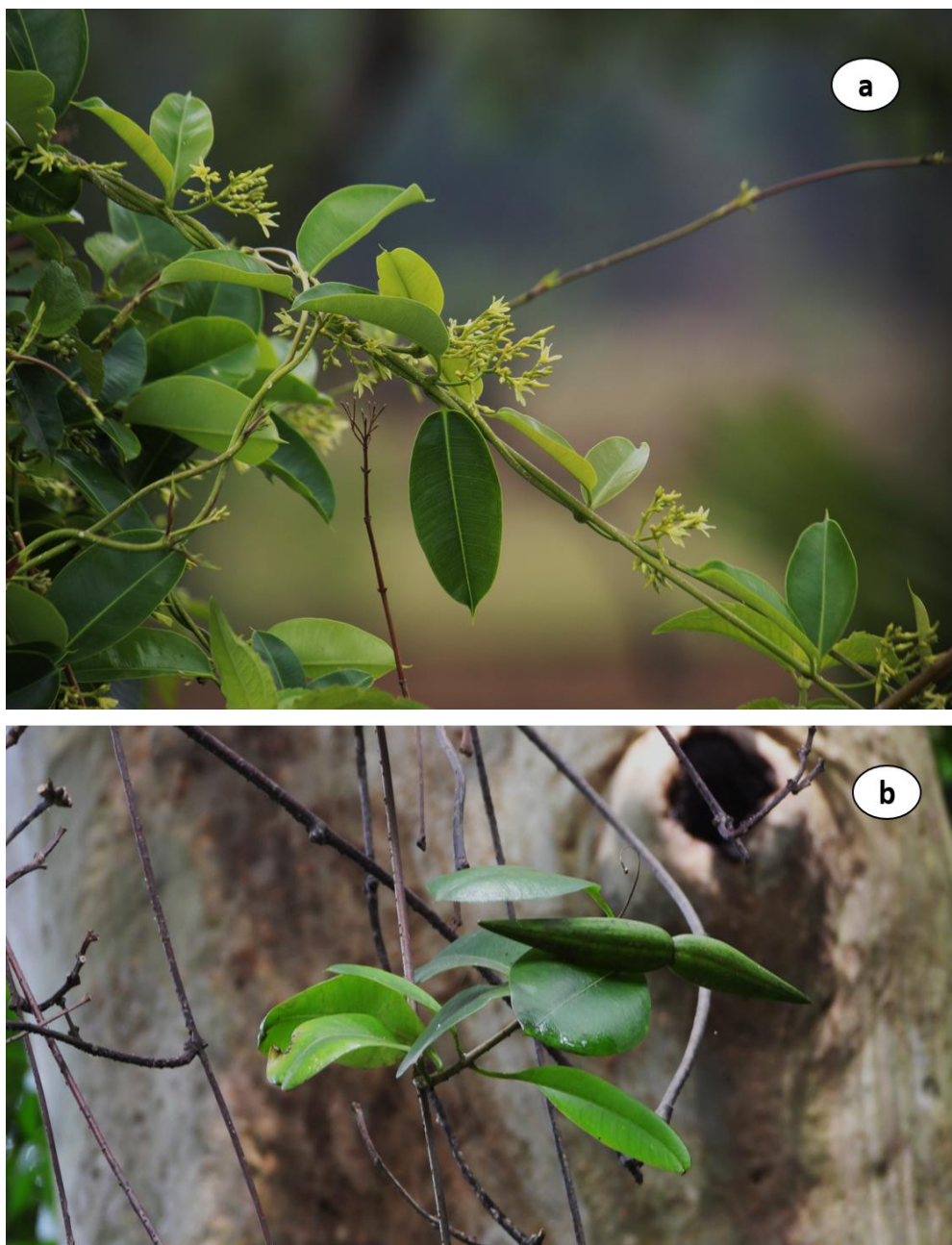


Plate 1: Vegetative parts of *C. buchananii*, a) Leaves and flowers, b) Fruits

BIOACTIVE COMPOUNDS

Preliminary phytochemical screening of *C. buchananii* revealed a rich diversity of bioactive secondary metabolites. Among these, a significant presence of coumarins, triterpenols, alcohols, and reducing compounds was noted (Sharma et al. 2011; Mili et al. 2024). Coumarins are known for their anti-inflammatory, anticoagulant, and antioxidant activities. Triterpenols, a class of triterpenoids with hydroxyl groups, are widely reported for their antimicrobial, antifungal, and anti-inflammatory effects, indicating their possible role in the plant's therapeutic efficacy. Alcohols and reducing compounds often serve as antioxidants, neutralizing free radicals and protecting cellular structures. From Gas Chromatography-Mass Spectrometry (GC-MS) analysis ten key compounds were found: tannins, alkaloids, saponins, glycosides, terpenes, flavonoids, phenols, proteins, steroids, and triterpenes. Each of these contributes distinct pharmacological actions (Dudheinamdar et al. 2024).

PHARMACOLOGICAL IMPORTANCE

Research on *C. buchananii* has highlighted its diverse pharmacological activities, aligning with its traditional use in Southeast Asian medicine.

Anti-Inflammatory and Analgesic Effects

Studies have demonstrated that methanol extracts of *C. buchananii* significantly reduce inflammation and pain in animal models. These effects are attributed to the inhibition of nitric oxide production and suppression of pro-inflammatory cytokines (Hanprasertpong et al. 2014).

Antioxidant and Hepatoprotective Properties

Ethanollic extracts of *C. buchananii* have shown antioxidant activity and protective effects against acetaminophen-induced liver toxicity in rats, indicating its potential for liver health support (Padmalochana et al. 2013).

Antidiabetic Potential

Recent studies have reported that methanol extracts of *C. buchananii* roots exhibit hypoglycemic effects in streptozotocin-induced diabetic rats, suggesting their potential in managing blood glucose levels (Ojha et al. 2023).

Antimicrobial Activity

C. burchanani extracts have demonstrated antibacterial properties, and when used in the synthesis of gold nanoparticles, they enhanced antimicrobial efficacy, indicating potential applications in developing antimicrobial agents (Wongyai et al. 2020).

Chondroprotective Activity

Research indicates that *C. burchanani* extracts can protect cartilage by reducing the degradation of cartilage matrix molecules and inhibiting matrix metalloproteinase-2 (MMP-2) activity, suggesting potential benefits in treating osteoarthritis (Hanprasertpong et al. 2014).

Table 1: Traditional uses with modern pharmacological correlation

Traditional Uses	Details	Modern Pharmacological Correlation
Bone Fractures	Used by Indian tribes to treat broken bones.	Likely linked to anti-inflammatory and chondroprotective effects, reducing swelling and supporting cartilage regeneration.
Rickets	Given to children for bone weakness.	While no direct pharmacological study on rickets exists, mineral-rich extracts and anti-inflammatory action may support bone metabolism.
Skin Diseases & Leprosy	Root as blood purifier and treatment for skin conditions.	Extracts show antibacterial and anti-inflammatory properties, supporting its use in skin infections.
Muscle Tension & Arthritis	Used for muscle stiffness and joint issues.	Validated by studies showing anti-inflammatory, analgesic, and chondroprotective actions.
Anti-inflammatory	Used traditionally to reduce swelling.	Confirmed by studies showing reduction in edema, cytokine

		inhibition, and NO suppression.
Chondroprotective	Used for joint and cartilage health.	Supported by inhibition of MMP-2 and cartilage matrix degradation in lab studies.
Paralysis, Tendon Stiffness	Used in neurological and muscular conditions.	While specific studies on nerve function are limited, anti-inflammatory effects may indirectly benefit such conditions.

CONCLUSION

Research over the past decade has revealed the medicinal significance of *Cryptolepis buchananii*, a climber deeply rooted in Indian traditional medicine. Modern pharmacological investigations have provided evidence for its anti-inflammatory, analgesic, and antioxidant properties, which align with its traditional uses in treating skin diseases, joint disorders, and systemic inflammation. The presence of unique phytoconstituents, such as cryptolepain and nicotinoyl-glucose derivatives, further enhances its scientific value. Given its multifaceted therapeutic potential, *C. buchananii* not only a natural remedy in ethnobotanical practices but also as a source of bioactive compounds for modern drug discovery. Future studies should focus on clinical validation, standardization of extracts, with exploration that can lead to the discovery of a drug formulation.

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